Quality Assurance Sampling and Analysis Plan

Site:
Riverside Avenue
29 Riverside Avenue
Newark, NJ 07104

Submitted to:
US EPA Region 2
2890 Woodbridge Avenue
Edison, NJ 08837

Prepared for:
US EPA Region 2
2890 Woodbridge Avenue
Edison, NJ 08837

Prepared by:
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KEMRON Project No. SE1838

Client: US EPA Region 2
Project: Riverside Avenue
KEMRON Project No.: SE1838

This document has been reviewed for technical content and quality, clarity, and style in accordance with the internal QA/QC procedures of KEMRON.

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1.0 SITE BACKGROUND

This site is located in the City of Newark, which is in Essex County in the State of New Jersey. The nearest residence is within 500__ feet to the:

☐ *North*	☐ *South*	☒ *East*	☐ *West*
☐ *Northeast*	☐ *Southeast*	☐ *Northwest*	☐ *Southwest*

The site is a:

☐ *battery reclamation*	☐ *neighborhood*	☐ *wood preservation facility*
☒ *chemical manufacturing*	☐ *salvage yard*	☐ *solvent recovery*
☐ *drum recycling*	☐ *private residence*	☐ *tannery*
☐ *incinerator/smelter*	☐ *refinery*	☒ *warehouse*
☐ *landfill*	☐ *resource recovery*	☐ *waste facility*
☐ *metal plating*	☐ *retail gas station*	☐ other _____

located on 2 acres which are:

☐ *still active*	☒ *now abandoned*	☐ *unknown*

It was abandoned in 2009. The following remedial units are present at the site:

☒ *buildings*	☐ *landfill*	☒ *surface water*
☐ *drainage ditch*	☐ *process area*	☒ *tank farm*
☒ *drums*	☐ *roads/access ways*	☐ *vats*
☐ *groundwater*	☒ *soil*	☐ *waste pile*
☐ *impoundment*	☐ *storage area*	☐ *wooded area*
☐ *laboratory*	☒ *storage tank*	☐ *other* _____
☐ *lagoon*	☐ *stormwater pond*	

The following types of materials were handled at the site:

☐ *acids*	☐ *bases*	☐ *inorganics*	☒ *organics*
☒ *petroleum products*	☒ *solvents*	☐ *volatile organics*	☒ *unknown*

The contaminants of concern are:

Contaminant	Concentration Range
Asbestos	Unknown
Polychlorinated Biphenyls	Unknown
Flammables	Unknown
Corrosives	Unknown
Unknowns	Unknown

The volumes of contaminated materials to be addressed are:

☒ *pounds* ☒ *tons* ☒ *cubic yards* ☒ *rolloff*
☒ *5 gallon* ☒ *55 gallon* ☒ *85 gallon* ☒ *500 gallon*
☐ *other* _____

The suspected contamination is a result of:

☐ *accident* ☐ *fire* ☐ *spill* ☐ *unknown*
☒ *improper waste and disposal*

The physical/chemical threat to the population is:

☐ *high* ☒ *moderate* ☐ *minimal*

The following sampling constraints have been identified:

☒ *there have not been any sampling constraints identified to date.*
☐ _____

The following additional information is known about the site:

Historical uses include varnish manufacturing, paint manufacturing, chemical storage.

The current stage/phase of the project is:

☐ *assessment* ☐ *emergency response* ☐ *remedial* ☒ *cleanup*
☐ *investigative* ☐ *other* _____

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The United State Environmental Protection Agency (USEPA) On-Scene Coordinator (OSC)/Remedial Project Manager (RPM) will provide overall direction to the KEMRON staff concerning project objectives, sampling needs, and schedule.

The KEMRON Project Manager (PM)/Response Manager (RM) is the primary contact with the USEPA OSC/RPM. The PM/RM is responsible for the development and completion of the Quality Assurance Sampling and Analysis Plan (QASAP), project team organization, and supervision of all project tasks.

3.0 DATA QUALITY OBJECTIVE RATIONALE

Data quality objectives (DQOs) are qualitative and quantitative statements developed by data users to specify the quality of data from field and laboratory data collection activities to support specific decisions or regulatory actions. The DQOs describe what data are needed, why the data are needed, and how the data will be used to address the problem being investigated. DQOs also establish numeric limits for the data to allow the data user (or reviewers) to determine whether data collected are of sufficient quality for use in their intended application. Two types of data can be generated from the sampling objective: screening data and definitive data.

3.1 Screening Objectives

The objective of screening data is to afford one with a quick and preliminary assessment of the site contamination. This objective for data quality is available for data collection activities that involve rapid, non-rigorous methods of analysis and quality assurance. This objective allows for the collection of the greatest amount of data with the least expenditure of time and money. The end user of the data should be aware that data collected for this objective have neither definitive identification of pollutants nor definitive quantitation of their concentration level.

Although there is no quality assurance data collected with this objective, a calibration or performance check of the method is required along with verification of the detection level. The screening objective does not preclude the adherence to prescribed quality control checks given in USEPA methods and standard operating procedures (SOPs) or the manufacturer's recommendations.

The screening objective is generally applied to but not limited to the following activities: physical and/or chemical properties of samples; extent and degree of contamination relative to concentration differences; delineation of pollutant plume in ground water (head space or soil gas analysis techniques); monitor well placement; waste compatibility; preliminary health and safety assessment; hazardous categorization; and preliminary identification and quantitation of pollutants.

3.2 Definitive Objective:

The definitive objective is used to assess the accuracy of the concentration level as well as the identity of the analyte(s) of interest from the analytical field or lab results. This quality objective is intended to give the decision-maker a level of confidence for a select group of critical samples so he/she can make a decision based on an action level with regard to treatment, disposal, site remediation and/or removal of pollutants, health risk or environmental impact, cleanup verification, pollutant source identification, delineation of contaminants, and other significant decisions where an action level is of concern.

Analyte-specific methods must be used for this quality objective. This objective is generally applied to (but not limited to) the following activities: physical and/or chemical properties of samples, extent and degree of contamination, verification of pollutant plume definition in groundwater, verification of human and safety assessment, verification of pollutant identification, and verification of cleanup.

The USEPA has requested KEMRON to complete the task as outlined in the delivery order. The DQO of this sampling event is to evaluate the potential health risks and environmental impacts, while determining the profile characteristics of the waste, for either off-site disposal or possible on-site stabilization.

Table 1 outlines the project-specific DQOs.

Table 1 Project-Specific Data Quality Objects

Data Quality Objective	Project-Specific Action
Problem statement	Historical activities at the site caused contamination, which posed a risk to human health. Evaluate the potential health risks and environmental impacts, while determining the profile characteristics of the waste, for either off-site disposal or possible on-site stabilization.
Identify the decisions	Evaluate the potential health risks and environmental impacts, while determining the profile characteristics of the waste, for either off-site disposal or possible on-site stabilization.
Identify inputs to the decision	Compare the analytical results to the hazardous waste characteristics to determine if the waste is hazardous or non-hazardous.
Define boundary of project	The work plan shows the boundaries of the site.
Develop the decision rule	If the material is hazardous it should be managed under Subtitle C. If the material is non-hazardous then it should be managed as a non-RCRA hazardous waste.
Specify limits on decision errors	A 95% confidence level is specified for this project.

3.3 General Description of DQOs

The usability of the data is matched to the DQOs. A number of factors relate to the quality of data and sample collection methods and are as important to consider as methods used for sample analysis. Following SOPs for both sample collection and analysis reduces sampling and analytical error. Complete chain-of-custody documentation, and adherence to required sample preservation techniques, holding times, and proper shipment methods ensure sample integrity. KEMRON employs trained, experienced technicians capable of all forms of sampling techniques. By utilizing trained personnel and following detailed site-specific sampling procedures, KEMRON will maintain the data quality at the site level. Obtaining valid and comparable data also requires adequate Quality Assurance/ Quality Control (QA/QC) procedures and documentation, as well as established detection and control limits.

"Valid data" is defined as results that are generated when the instrument and quality controls are within the designated limits. Data validation procedures are designed to systematically review data quality and to assign qualifiers that indicate limited usability of other data.

3.4 Measurement of Data Quality

KEMRON's QA objective is to ensure that environmental monitoring data of known and acceptable quality are collected to sufficiently characterize the hazardous and non-hazardous material for disposal, and to support cleanup actions at the site. To meet this goal, the following quality control parameters will be evaluated: precision, accuracy, representativeness, comparability, and completeness. These parameters will be evaluated by the laboratory during analyses and will be evaluated by KEMRON during the final data validation. The precision and accuracy criteria presented in Appendix A will be utilized for data validation if laboratory-generated precision and accuracy criteria are not available.

3.4.1 Precision

Precision is a measure of mutual agreement among individual measurements of the same property under prescribed and similar conditions.

Precision of the measurement data for this project will be based upon duplicate analyses (replicability), control sample analyses (repeatability), and results for duplicate field samples (sample replicability). A field duplicate is defined as a sample that is divided into two equal parts for the purpose of analysis. Field duplicates will be collected for all sample matrices and analyzed for all parameters. Discretely sampled field duplicates are useful in determining sampling variability. However, greater than expected differences between duplicates may occur because of variability in the sample material. Field duplicates shall be used as a quality control measure to monitor precision relative to sample collection activities.

Analytical precision shall be evaluated by using matrix spike/matrix spike duplicates (MS/MSDs), laboratory control samples (LCSs) or by using sample duplicates. Precision is calculated in terms of relative percent difference (RPD). RPDs must be compared to the laboratory-established RPD for the analysis. Precision of duplicates may depend on sample homogeneity. The analyst or his/her supervisor must investigate the cause of data outside stated acceptance limits. Corrective action may include recalibration, re-analysis of QC samples, sample re-analysis, or flagging the data as suspect if problems cannot be resolved.

3.4.2 Accuracy

Accuracy is the degree of agreement of a measurement or average of measurements with an accepted reference or "true" value. Accuracy is a measure of bias in the system.

Accuracy of the measurement data will be assessed and controlled as follows. Results for blanks, matrix, laboratory control, and surrogate spikes will be the primary indicators of accuracy. These results will be used to control accuracy within acceptable limits by requiring that they meet specific criteria. As spiked samples are analyzed, spike recoveries will be calculated and compared to pre-established acceptance limits.

Acceptance limits will be based upon previously established laboratory capabilities for similar samples using control chart techniques. In this approach, the control limits reflect the minimum and maximum recoveries expected for individual measurements for an in-control system. Recoveries outside the established limits indicate some assignable cause, other than normal measurement error, and the need for corrective action. This includes recalibration of the instrument, re-analysis of the QC sample, re-analysis of the samples in the batch, or flagging the data as suspect if the problem cannot be resolved. Recovery of matrix spikes may depend on sample homogeneity.

3.4.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. The characteristics of representativeness are usually not quantifiable. Subjective factors to be taken into account are as follows:

- Degree of homogeneity of a site;
- Degree of homogeneity of a sample taken from one point in a site; and
- Available information on which a sampling plan is based.

Field duplicates, as defined under precision, are also used to assess representativeness. Two samples collected at the same location and at the same time are considered to be equally representative of this condition, at a given point in space and time. To maximize representativeness of results, sampling techniques, sample size, and sample locations will be carefully chosen to provide laboratory samples

representative of the site and the specific area. For instance, soil samples are likely to be less homogeneous than liquid waste samples, and thus it is important for the sampler and analyst to follow SOPs when collecting soil samples. Samples exhibiting obvious stratification or lithologic changes should not be used as replicates. Within the laboratory, precautions are taken to extract from the sample container an aliquot representative of the whole sample. However, samples requiring analysis of volatile organic compounds (VOCs) should not be mixed.

3.4.4 Comparability

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved sample collection techniques and analytical methods, consistency in the basis of analysis, consistency in reporting units, and analysis of standard reference materials.

The use of standard methods to collect and analyze samples, along with instruments calibrated against Standard Analytical Reference Materials (SARMs), which are National Institute for Standards and Technology (NIST) traceable standards, will also ensure comparability.

Comparability also depends on the other data quality characteristics. Only when data are judged to be representative of the environmental conditions, and when precision and accuracy are known, can data sets be compared with confidence.

3.4.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under controlled laboratory conditions.

Data completeness is a measure of the extent to which the database resulting from a measurement effort fulfills objectives for the amount of data required. Completeness is defined as the valid data percentage of the total tests requested.

Valid analyses are defined as those where the sample arrived at the laboratory intact, properly preserved, in sufficient quantity to perform the requested analyses, and accompanied by a completed chain-of-custody form. Furthermore, the sample must be analyzed within the specified holding time and in such a manner that analytical QC acceptance criteria are met.

3.5 Special Training Requirements/Certifications

Personnel assigned to the site, including field personnel and subcontractors, will be qualified to perform the tasks to which they are assigned. Each staff member will have the education, training, technical knowledge, and experience to perform assigned functions.

Training shall be provided, if needed, to achieve initial proficiency; maintain proficiency; and adapt to changes in technology, methods, or job responsibilities. Training will be documented on the appropriate form, and placed in the site file as a record.

Site personnel will receive an orientation to the appropriate work plans, including this QASAP, and the Health and Safety Plan (HASP), as appropriate to their responsibilities before participation in site activities. The KEMRON PM/RM or a qualified designee will provide training of field personnel. Training of laboratory personnel will be the responsibility of the subcontractor laboratory. Copies of personnel training and qualification records will be kept on file in the form of resumes and training and

orientation records. Subcontractor records will be reviewed during audits. KEMRON records maintenance is the responsibility of the PM/RM.

The frequency of sample collection is outlined in Table 2 below.

Table 2 Field Sampling Summary

Analytical Parameters	Matrix	Subtotal Samples	Trip Blanks*	Field Blanks**	Equipment Blanks***	Duplicate Samples[1]	MS/MSD Samples[1]	Total Field Samples
VOA (8260B)	Oil, water, solids, solvents, unknowns	up to 30	1 per cooler	1 per day	1 per day	1 per 20	1per 20	up to 40
BNA (8270C)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
Pesticides (8081A)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
Herbicides (8151A)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
PCB (8082)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
TAL Metals (6010/7000)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
TCLP-VOA (1311/8260B)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
TCLP-BNA (1311/8270C)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
TCLP- Pesticides (1311/8081A)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
TCLP-Herbicides (1311/8151A)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
TOX (9060)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
Ignitability (1010)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
Reactivity (SW-846 Ch 7)	Oil, water, solids,	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40

Analytical Parameters	Matrix	Subtotal Samples	Trip Blanks*	Field Blanks**	Equipment Blanks***	Duplicate Samples[1]	MS/MSD Samples[1]	Total Field Samples
	solvents, unknowns							
TCLP-Total Metals plus Cu, Zn	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
Nitrates, Sulfate Chlorides, TSS, Fluorides, TS Phosphates	Water, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
Corrosivity (9040B)	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40
% Water	Oil, water, solids, solvents, unknowns	up to 30	NA	1 per day	1 per day	1 per 20	1 per 20	up to 40

Notes:
[1] Note required for QA-1 (screening)
* Trip blanks will be required for environmental samples but not for waste samples
** Field blanks will be performed at a rate of two per day, once per four-hour sampling period.
***Equipment blanks will be performed at a rate of two per day per piece of equipment that has been decontaminated. If dedicated equipment is utilized there will not be a need for a rinsate blank.

Table 3 Data Quality Objectives for Removal Activities

Sampling Objective	Data Type
☒ Emergency Response	Screening
☐ Emergency Response	Definitive
☒ Determine identification of contaminants	Screening
☐ Determine identification of contaminants	Definitive
☒ Extent of contamination	Screening
☐ Extent of contamination	Definitive
☒ Treatment and disposal options	Screening
☐ Treatment and disposal options	Definitive

Table 4 Data Quality Objectives for Site Assessment Activities

Sampling Objective	Data Type
☒ Treatment and disposal options	Screening
☐ Treatment and disposal options	Definitive
☐ Quantity of contamination	Screening
☐ Quantity of contamination	Definitive
☐ Determine identification of contaminants	Screening
☐ Determine identification of contaminants	Definitive

The required confidence level for definitive data is:

☐ 85% ☐ 90% ☒ 95%

Rational for confidence levels less that 95% is not acceptable.

4.0 SAMPLING DESIGN

The following waste streams will be sampled as indicated in Table 5.

Table 5 Contaminant Sources, Recommended Analysis, and Proposed Methods

Sample Source	Contaminant Sources	Recommended Analysis	Analytical Methods
☐ Recyclable Solvents	drums, tanks, containers	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		TCL Volatiles	8260B
		TCL Semivolatiles	8270C
		PCBs	8082
		TAL Metals	6010B/7000/7470
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020B
		% ASH	1209/D2974
		BTU	BTU- D240-76
		% Water	Karl Fischer
		Chlorine content	ASTM D808/EPA 300.0
		Bromine content	ASTM D808/EPA 300.0
		Iodine content	ASTM E442/D3869C
		Sulfur content	ASTM D4239
☐ Recyclable Feedstock	drums, tanks, containers	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TAL Metals	6010B/7000 /7470
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		Total Organic Halogens	9020B
		% ASH	1209/D2974
		BTU	BTU- D240-76
		% Water	Karl Fischer
		Chlorine content	ASTM D808/EPA 300.0
		Bromine content	ASTM D808/EPA 300.0
		Iodine content	ASTM E442/D3869C
		Sulfur content	ASTM D4239
☒ Flammable Waste	drums, tanks, containers	Ignitability	1010
		Corrosivity pH	9040B

Sample Source	Contaminant Sources	Recommended Analysis	Analytical Methods
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCL Volatiles	8260B
		TCL Semivolatiles	8270C
		TAL Metals	6010B/7000 /7470
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020B
		% ASH	1209/D2974
		BTU	BTU- D240-76
		% Water	Karl Fischer
		Chlorine content	ASTM D808/EPA 300.0
		Bromine content	ASTM D808/EPA 300.0
		Iodine content	ASTM E442/D3869C
		Sulfur content	ASTM D4239
☒ Combustible Waste i.e., diethylene glycol ethyl ether	drums, tanks, containers	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		TCL Volatiles	8260B
		TCL Semivolatiles	8270C
		PCBs	8082
		TAL Metals	6010B/7000/7470
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311//8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		Total Organic Halogens	9020B
		% ASH	1209/D2974
		BTU	BTU- D240-76
		% Water	Karl Fischer
		Chlorine content	ASTM D808/EPA 300.0
		Bromine content	ASTM D808/EPA 300.0
		Iodine content	ASTM E442/D3869C
		Sulfur content	ASTM D4239
☒ Corrosive (Acidic)	drums, vats, tanks	Ignitability	1010
		Acidity	EPA 305
		Corrosivity toward steel	1110
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A

Sample Source	Contaminant Sources	Recommended Analysis	Analytical Methods
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		TAL Metals	6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020B
		Total Organic Carbon (TOC)	9060
		Chlorides	9056/9012/9253
		Fluorides	9056/9214
		Total Phosphorus	9056/EPA 365.2
		Sulfates	9056/9038
		Nitrates	9056
☒ Corrosive (Basic)	drums, vats, tanks	Ignitability	1010
		Alkalinity	EPA 310
		Corrosivity pH	9040B
		Corrosivity toward steel	1110
		PCBs	8082
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		TAL Metals	6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020B
		Total Organic Carbon (TOC)	9060
☐ Chlorinated Hydrocarbons i.e., dichloromethane, TCE, PCE	drums, vats, tanks	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		TCL Volatiles	8260B
		TCL Semivolatiles	8270C
		PCBs	8082
		TAL Metals	6010B/7000 /7470
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020B
		% ASH	1209/D2974
		BTU	BTU- D240-76
		% Water	Karl Fischer
		Chlorine content	ASTM D808/EPA 300.0
		Bromine content	ASTM D808/EPA 300.0
		Iodine content	ASTM E442/D3869C
		Sulfur content	ASTM D4239
☒ Neutral Water	drums, containers, tanks, rinse and decon water	Ignitability	1010

Sample Source	Contaminant Sources	Recommended Analysis	Analytical Methods
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		TAL Metals	6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020B
		Total Organic Carbon (TOC)	9060
		Total Solids	EPA 160.3
		Total Suspended Solids	EPA 160.2
		Total Dissolved Solids	EPA 160.1
		Acidity	EPA 305.1
		Alkalinity	EPA 310.1/310.2
		Total Ammonia	EPA 350.2
☒ Neutral Inert Solids	containers, tanks	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020B
		Total Solids	EPA 160.3
		Total Phenols	9065/9066/9067
☒ Debris	crushed drums, PPE	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311//8151A
		TCLP Metals	1311/6010B/7000/7470
		Paint Filter Test (free liquids)	9095A
		Density	SM213E
☒ Soil [2]	contaminated soil	Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470

Sample Source	Contaminant Sources	Recommended Analysis	Analytical Methods
		Density	SM213E
		Total Organic Halogens	9020B
		Total Phenols	9065/9066/9067
		Paint Filter Test (free liquids)	9095A
		Total Solids	EPA 160.3
☒ Oxidizers	drums, containers, tanks	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		DOT Oxidizer Test	49 CFR Part 173 Appendix F
☒ Waste Oils	drums, containers, tanks	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		TCL Volatiles	8260B
		TCL Semivolatiles	8270C
		PCBs	8082
		TAL Metals	6010B/7000 /7470
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311//8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010B/7000/7470
		Density	SM213E
		Total Organic Halogens (TOX)	9020A
		% ASH	1209/D2974
		BTU	BTU- D240-76
		% Water	Karl Fischer
		Chlorine content	ASTM D808/EPA 300.0
		Bromine content	ASTM D808/EPA 300.0
		Iodine content	ASTM E442/D3869C
		Sulfur content	ASTM D4239
☒ Site Debris	Debris piles	Ignitability	1010
		Corrosivity pH	9040B
		Reactivity	SW-846 7.3.3.2, 7.3.4.2
		PCBs	8082
		TCLP Volatiles	1311/8260B
		TCLP Semivolatiles	1311/8270C
		TCLP Pesticides	1311/8081A
		TCLP Herbicides	1311/8151A
		TCLP Metals	1311/6010A/7000/7470
		Density	SM213E
		Paint Filter Test (free liquids)	9095

Notes:
[1] No analytical may be required if the material is cleaned in accordance with the standard in 40 CFR Part 268.45.
[2] Some states may require additional parameters than those listed (i.e., Pennsylvania's Form U).

Appendix B contains a brief description of the various sampling approaches listed in Table 6.

Table 6 Sampling Approaches

Type of Sample	Sampling Approach	Background Sample Collection	Composite Scheme*
☒ Drum Liquid	Judgmental	NA	☐1 or ☒ 2
☐ Drum Liquid	Random	NA	☐1 or ☐ 2
☒ Drum Solid	Judgmental	NA	☐1 or ☒ 2
☐ Drum Solid	Random	NA	☐1 or ☐ 2
☐ Drum Solid	Systematic Random	NA	☐1 or ☐ 2
☒ Tank Liquid	Judgmental	NA	☐1 or ☒ 2
☐ Tank Liquid	Random	NA	☐1 or ☐ 2
☐ Tank Liquid	Stratified Random	NA	☐1 or ☐ 2
☐ Tank Liquid	Systematic Random	NA	☐1 or ☐ 2
☐ Tank Liquid	Systematic Grid	NA	☐1 or ☐ 2
☒ Tank Solid	Judgmental	NA	☐1 or ☒ 2
☐ Tank Solid	Random	NA	☐1 or ☐ 2
☐ Tank Solid	Stratified Random	NA	☐1 or ☐ 2
☐ Tank Solid	Systematic Random	NA	☐1 or ☐ 2
☐ Tank Solid	Systematic Grid	NA	☐1 or ☐ 2
☒ Waste Pile	Judgmental	NA	☐1 or ☒ 2
☐ Waste Pile	Random	NA	☐1 or ☐ 2
☐ Waste Pile	Stratified Random	NA	☐1 or ☐ 2
☐ Waste Pile	Systematic Random	NA	☐1 or ☐ 2
☐ Waste Pile	Systematic Grid	NA	☐1 or ☐ 2
☐ Waste Pile	Hot Spots	NA	☐1 or ☐ 2
☒ Soil	Judgmental	☐Y or ☒N	☐1 or ☒ 2
☐ Soil	Random	☐Y or ☐N	☐1 or ☐ 2
☐ Soil	Stratified Random	☐Y or ☐N	☐1 or ☐ 2
☐ Soil	Systematic Random	☐Y or ☐N	☐1 or ☐ 2
☐ Soil	Systematic Grid	☐Y or ☐N	☐1 or ☐ 2
☒ Soil	Hot Spots	☐Y or ☒N	☐1 or ☒ 2
☐ Sediment	Judgmental	☐Y or ☐N	☐1 or ☐ 2
☐ Sediment	Random	☐Y or ☐N	☐1 or ☐ 2
☐ Sediment	Stratified Random	☐Y or ☐N	☐1 or ☐ 2
☐ Sediment	Systematic Random	☐Y or ☐N	☐1 or ☐ 2
☐ Sediment	Systematic Grid	☐Y or ☐N	☐1 or ☐ 2
☐ Groundwater	Random	☐Y or ☐N	☐1 or ☐ 2
☐ Groundwater	Systematic Random	☐Y or ☐N	☐1 or ☐ 2
☐ Surface water	Judgmental	☐ upstream or ☐N	☐1 or ☐ 2
☐ Surface water	Random	☐ upstream or ☐N	☐1 or ☐ 2
☐ Surface water	Systematic Random	☐ upstream or ☐N	☐1 or ☐ 2

*The composite schemes are as follows:

1 = Samples will not be composited.

2 = Samples exhibiting like characteristics will be composited and a grab sample taken from the composite. Samples to be analyzed for volatile organics will not be composited.

5.0 SAMPLING REQUIREMENTS AND COLLECTIONS

Table 7, Sampling Requirements Summary, contains information pertinent to sampling, such as the sample container types and the quantity to be collected at each sampling location, the preservation method to be utilized, and the sample holding times (based on the parameter being analyzed for and the matrix).

Table 7 Sampling Requirements Summary

Analytical Group	Soil/Sediment			Water/Wastewater[1]			Waste		
	Cont	Pres	Hold	Cont	Pres	Hold	Cont	Pres	Hold
Biological									
Bacteriological*	--	--	--	B	I	6hr	--	--	--
Toxicity, Acute	--	--	--	CU	I	2	--	--	--
Toxicity, Chronic	--	--	--	CU	I	2	--	--	--
Inorganics									
pH*	8G	NA	--	--	--	--	8G	NA	N
Dermal Corrosion	--	--	--	--	--	--	8G	NA	N
Flashpoint	--	--	--	--	--	--	8G	NA	N
BTU Content	--	--	--	--	--	--	8G	NA	N
Ash Content	--	--	--	--	--	--	8G	NA	N
Residual Chlorine*	--	--	--	SM	NA	I	--	--	--
Turbidity	--	--	--	SM	I	2	--	--	--
Conductivity	--	--	--	SM	I	28[11]	--	--	--
Temperature*	--	--	--	SM	NA	I	--	--	--
BOD5	--	--	--	HP[2]	I	2	--	--	--
Solids Series	--	--	--	HP	I	7	--	--	--
Settleable Solids	--	--	--	HP	I	2	--	--	--
Nutrients (N,P)	8G	I	NS	HP	S/I	28	--	--	--
Chloride	--	--	--	LP	NA	28	--	--	--
Ortho-P	8G	I	NS	LP	I[4]	2	--	--	--
Dissolved P	--	--	--	LP	S[4]/I	28	--	--	--
COD	8G	I	NS	LP	S/I	28	--	--	--
Alkalinity	--	--	--	LP	I	14	--	--	--
Color	--	--	--	GP	I	2	--	--	--
Oil & Grease*	--	--	--	LG	S/I	28	--	--	--
Metals	8G	I	180	LP	N	180	8G	NA	180
Mercury	8G	I	28	LP	N	28	8G	NA	28
Metals – TCLP (except Mercury)	8G	I	360[12]	LP	I	360[12]	8G	NA	360[12]
Mercury - TCLP	8G	I	56[19]	LP	I	56[19]	8G	NA	56[19]
Chromium VI	--	--	--	LP	I	1	--	--	--
Cyanide	--	--	--	LP	A[5]/C[6]/I	14	8G	NA	14
Sulfides	--	--	--	LP	Z/C[7]/I	7	--	--	--
Sulfates	--	--	--	LP	I	28	--	--	--
Nitrite	--	--	--	LP	I	2	--	--	--
Nitrate	--	--	--	HP	I	2	--	--	--
Hardness	--	--	--	LP	N	180	--	--	--
Fluoride	--	--	--	LP	NA	28	--	--	--
Organics									

Analytical Group	Soil/Sediment			Water/Wastewater[1]			Waste		
	Cont	Pres	Hold	Cont	Pres	Hold	Cont	Pres	Hold
VOCs*	2G	I	14	V	B[8]/I	14/7[16]	8G	NA	14
VOCs - TCLP*	2G	I	28[13]	V	I	28[13]	8G	NA	28[13]
Extractables[19]	8G	I	54[18]	GG	I[9]	47[17]	8G	NA	54[18]
Extractables - TCLP	8G	I	61[14]	GG	I	61[14]	8G	NA	61[14]
Dioxins[20]	A	I	75[15]	LA[3]	I[10]	75[15]	A	I	75[15]
Percent Alcohol	8G	I	NS	GG	I	NS	8G	NA	NS
Phenols	--	--	--	LA	S/I	28	--	--	--
Org Halide (TOX)	8G	I	28	LA	S/I	28	--	--	--

General Footnotes:

Cont - Container
Pres - Preservation
Hold - Holding Time (days)
* - Grab sample only, unless indicated a grab or composite is acceptable.
1 - Consult 40 CFR Part 136 Table II. - Required Containers, Preservation Techniques, and Holding Times for latest requirements.
19 - Including pesticides, herbicides and PCBs
20 - Consult local laboratory for most recent dioxin container and preservation requirements.

Containers:

B - Bacteriological container
CU - Cubitainer: one gallon or 2 gallon
8G - 8 oz. widemouth glass (Teflon lid)
2G - 2 oz. widemouth glass (Teflon septum lid)
LP - One liter polyethylene
GG - One gallon amber glass (Teflon lid)
V - 40 ml glass (Teflon septum lid)
SM - Stormore 500 ml polyethylene
LG - One liter widemouth glass (Teflon lid)
GP - Gallon polyethylene
HP - Half-gallon polyethylene
LA - One liter amber glass (Teflon lid)
A - 500 ml widemouth amber glass (Teflon lid)
2 - Use GP for BOD with multiple parameters
3 - Collect 2 sample containers (LA) per sample plus 4 at one location for matrix spike

Preservatives:

A - Ascorbic acid
B - Sodium bisulfite
C - NaOH
H - HCl
I - Ice (4oC)
N - 50% HNO3 (pH < 2.0 S.U.)
NA - Not applicable
S - 50% H2SO4 (pH < 2.0 S.U.)
Z - Zinc acetate

4 - Filter on-site
5 - Only with residual CL2
6 - To pH > 12.0 S.U.
7 - To pH > 9.0 S.U.
8 - With residual CL2 mix sample in 8-oz. glass container with 8 drops 25% ascorbic acid
9 - With residual CL2 mix sample with 0.008% sodium thiosulfate
10 - With residual CL2 mix sample with 80 mg of sodium thiosulfate per liter

Holding Times: in days unless noted otherwise:

NS - Not Specified
N - Indefinite
I - Immediate (within 15 minutes: 40 CFR 136 Table II)
11 - Determine on-site if possible
12 - 360 days: 180 days to extraction plus 180 days to analysis
13 - 28 days: 14 days to TCLP extraction plus 14 days to analysis (7 days if not preserved following extraction)
14 - 61 days: 14 days to TCLP extraction, 7 days to solvent extraction, 40 days to analysis
15 - Method 8290 specifies 30 days to extraction plus 45 days to analysis
16 - 7 days if not preserved
17 - 47 days: 7 days to extraction, 40 days to analysis
18 - 54 days: 14 days to extraction, 40 days to analysis
19 - 56 days: 28 days to extraction plus 28 days to analysis

Table 8 shows the sampling equipment/media will be used to obtain environmental samples from the respective matrix.

Table 8 Sampling Equipment/Media

Parameter/Matrix	Equipment/Media	Fabrication	Dedicated
☒ TCLP/Drum Liquid	Drum Thief	Glass	Yes
☒ TCLP/Drum Liquid	Coliwasa	Glass	Yes
☐ TCLP/ Drum Solid	Sample Thief	PVC	Yes
☐ TCLP/ Drum Solid	Sample Thief	Stainless Steel	☐Y / ☐N
☒ TCLP/ Drum Solid	Spoon	Stainless Steel	☒Y / ☐N
☒ TCLP/ Waste Pile	Spoon	Stainless Steel	☒Y / ☐N
☐ TCLP/ Waste Pile	Sample Thief	Stainless Steel	☐Y / ☐N
☐ TCLP/ Tank Liquid	Bacon Bomb	Stainless Steel	☐Y / ☐N
☒ TCLP/ Tank Liquid	Coliwasa	Glass	Yes
☒ TCLP/ Tank Solid	Sample Thief	PVC	Yes
☐ TCLP/ Tank Solid	Sample Thief	Stainless Steel	☐Y / ☐N
☒ TCL/Drum Liquid	Drum Thief	Glass	Yes
☒ TCL/Drum Liquid	Coliwasa	Glass	Yes
☒ TCL/ Drum Solid	Spoon	Stainless Steel	☒Y / ☐N

Parameter/Matrix	Equipment/Media	Fabrication	Dedicated
☒ TCL/ Waste Pile	Spoon	Stainless Steel	☒Y / ☐N
☐ TCL/ Waste Pile	Sample Thief	Stainless Steel	☐Y / ☐N
☐ TCL/ Tank Liquid	Bacon Bomb	Stainless Steel	☐Y / ☐N
☒ TCL/ Tank Liquid	Coliwasa	Glass	Yes
☒ TAL/Drum Liquid	Drum Thief	Glass	Yes
☒ TAL/Drum Liquid	Coliwasa	Glass	Yes
☒ TAL/ Drum Solid	Spoon	Stainless Steel	☒Y / ☐N
☒ TAL/ Waste Pile	Spoon	Stainless Steel	☒Y / ☐N
☐ TAL/ Waste Pile	Sample Thief	Stainless Steel	☐Y / ☐N
☐ TAL/ Tank	Bacon Bomb	Stainless Steel	☐Y / ☐N
☒ TAL/ Tank	Coliwasa	Glass	Yes
☐ TCLP/Sediment	Dredges	Stainless Steel/Brass	No
☐ TCLP/Sediment	Coring	Stainless Steel or Teflon	☐Y / ☐N
☐ TCLP/Sediment	Scoops/Spoon	Stainless Steel	☐Y / ☐N
☐ TCL/Sediment	Dredges	Stainless Steel/Brass	No
☐ TCL/Sediment	Coring	Stainless Steel or Teflon	☐Y / ☐N
☐ TCL/Sediment	Scoops/Spoon	Stainless Steel	☐Y / ☐N
☐ TAL/Sediment	Dredges	Stainless Steel/Brass	No
☐ TAL/Sediment	Coring	Stainless Steel or Teflon	☐Y / ☐N
☐ TAL/Sediment	Scoops/Spoon	Stainless Steel	☐Y / ☐N
☒ TCLP/Soil	Spoon/Trowel	Stainless Steel	☒Y / ☐N
☐ TCLP/ Soil	Hand Auger	Stainless Steel	☐Y / ☐N
☐TCLP/ Soil	Drill Rig/Back hoe	Carbon Steel	No
☒ TCL/ Soil	Spoon/Trowel	Stainless Steel	☒Y / ☐N
☐ TCL/ Soil	Hand Auger	Stainless Steel	☐Y / ☐N
☐TCL/ Soil	Drill Rig/Back hoe	Carbon Steel	No
☒ TAL/ Soil	Spoon/Trowel	Stainless Steel	☒Y / ☐N
☐ TAL/ Soil	Hand Auger	Stainless Steel	☐Y / ☐N
☐ TAL/ Soil	Drill Rig/Back hoe	Carbon Steel	No

6.0 SAMPLING STANDARD OPERATING PROCEDURES

The following sampling SOPs will be implemented for this project (copies included in Appendix C) as applicable. These are typically procedures that may be varied or changed as required, dependent upon site conditions or equipment limitations. In all instances, the ultimate procedures employed should be documented and associated with the final project deliverables.

- Sampling Equipment and Container Decontamination
- Groundwater Sampling
- Drum Sampling
- Soil Sampling
- Large Vessel Sampling
- Surface Water Sampling

Field decontamination procedures are outlined in Appendix D.

7.0 SAMPLING DOCUMENTATION

All sample documents will be completed legibly and in ink. Any corrections will be made by lining-through the original entry and initialing the change.

7.1 Field Logbook

All sample documents will be completed legibly and in ink. Any corrections will be made by lining through the original entry and initialing the change. The following sample documentation will be maintained as necessary:

- Site name
- Names of personnel on site
- Dates and times of all entries
- Descriptions of all site activities
- Noteworthy events and discussions
- Weather conditions
- Site observations
- Identification and description of samples and locations
- Subcontractor information and names of on-site personnel
- Dates and times of sample collection and Chain of Custody (COC) information
- Records of photographs
- Site sketches
- Sample Labels
- Site name and project number
- Date and time the sample was collected
- Sample preservation
- Sampling location
- Chain-of Custody Record
- Sample identification
- Sample location
- Sample collection date and time
- Sample information (e.g., matrix, number of bottles, etc.)
- Names and signatures of samplers
- Signatures of all individuals who have had custody of the samples

7.2 Sampling Handling and Shipment

Environmental samples will be packaged and shipped as described below.

1. Samples will be shipped per Department of Transportation (DOT) and International Air Transportation Association (IATA) guidelines.
2. All sample containers will be placed in waterproof metal or equivalent plastic ice chests or coolers only.
3. After the pertinent information is on the sample label and tag, if required, the tag is secured around the sample container lid.
4. The volume level of the sample in the sample container is marked with a grease pencil.
5. Cushioning material is placed in the bottom of the cooler.

6. The bottles are sealed in clear plastic bags, with labels and tags clearly visible. The enclosed are placed upright in the cooler so that they do not touch during transit.
7. Temperature blanks are used to monitor cooler temperature.
8. Ice bags are placed around, among, and on top of the sample bottles.
9. The cooler is filled with cushioning material.
10. Paperwork is placed in a waterproof plastic bag and closed.
11. The cooler drain is taped shut.
12. The cooler lid is secured with tape by wrapping it around the cooler in at least two places without covering any labels.
13. Completed shipping label is attached to the top of the cooler.
14. If needed, numbered and signed custody seals are affixed on front right and back left of the cooler. The seals are covered with wide, clear tape.
15. Samples will be express-shipped (overnight) to the laboratory under COC protocols previously discussed.

8.0 QUALITY ASSURANCE REQUIREMENTS

The following QA requirements will be implemented on this project:

☒ *Screening Data* ☐ *Screening Data with Definitive Confirmation*

8.1 Screening Data

Screening data are generated by rapid less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and clean up. Screening data provide analyte identification and quantification, although the quantification may be relatively imprecise. At least 10% of the screening data are confirmed using the analytical method and QA/QC procedures and criteria associated with definitive data. Screening data without associated confirmation data are not considered to be data of known quality. Screening data without associated confirmation data are not considered to be data of known quality.

Screening data QA/QC Elements:

- Sample documentation
- Chain of Custody
- Sampling design approach
- Initial and continuing calibration
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantification

8.2 Screening Data with Definitive Confirmation

For definitive confirmation, at least 10 percent of the screening data are confirmed using analytical methods and quality control procedures and criteria associated with definitive data. Definitive data are generated using rigorous analytical methods, such as EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods generating definitive data produce

tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the quality control requirements are satisfied.

Definitive Data QA/QC Elements:

- Sample results summary
- Cross reference sample ID (laboratory/client
- Sample holding times
- Detection limits and qualifiers
- Internal and external chain of custody documentation
- Initial and continuing calibration data
- Interference check sample (ICP)
- ICP serial dilution
- Initial and continuing blank data (inorganics)
- Method blanks (instrument, extraction, etc.)
- Surrogate spike data with control limits
- Matrix spike/matrix spike duplicate with control limits (organics)
- Matrix spike and duplicate with control limits (inorganics)
- Laboratory Control Sample with control limits
- Internal standard area count and retention time
- GC/MS tuning criteria
- Second column confirmation data
- Raw data
- A case narrative to include cleanup and dilution procedures and interference's encountered
- Performance Evaluation samples (when required)

9.0 DATA VALIDATION

Data generated for this project will be validated as follows:

9.1 Screening Data

Screening data need only be evaluated for calibration and detection limits. Confirmation data generated under this QASAP will be evaluated accordingly with the appropriate criteria listed in Section 8.0 above.

9.2 Definitive Data

This objective requires that at least 10% of the samples in the analytical data package be evaluated for all of the elements listed in Section 8.0 of this QASAP. The remaining samples will be reviewed for holding times, blank contamination, precision, accuracy, detection limits, and confirmed compound identification. This objective also requires review of all elements for all samples in each analyte category in every tenth data package received from the individual lab.

10.0 DELIVERABLES

The KEMRON PM/RM will maintain contact with the USEPA OSC/RPM to provide information regarding the technical and finical progress of the project. This communication will begin when the

project is assigned. **All solid/soil/sediment samples that are analyzed for PCBs are required to be reported on a dry-weight basis.**

The items checked below will be included as standard deliverables.

☒ *Analysis*	☒ *Analytical Report*	☒ *Data Review*
☒ *Final Report*	☐ *Maps and Figures*	☐ *Status Report*
☐ *Trip Report*		

Appendix A

Precision and Accuracy Criteria

Estimated Reporting Limits for Method 8260B

Analyte Volatile Organic Compounds SW-8260B	Aqueous Samples		Soil Samples
	Estimated Reporting Limit[(b)] (µg/L) 5 ml purge	Estimated Reporting Limit[(b)] (µg/L) 25 ml purge	Estimated Reporting Limit[(b)] (µg/kg) Low level Soil/sediment
Dichlorodifluoromethane	5	1	5
Chloromethane	5	1	5
Vinyl chloride	5	1	5
Bromomethane	5	1	5
Chloroethane	5	1	5
Trichlorofluoromethane	5	1	5
1,1-Dichloroethene	5	1	5
Methylene chloride	5	1	5
trans-1,2-Dichloroethene	5	1	5
1,1-Dichloroethane	5	1	5
2,2-Dichloropropane	5	1	5
cis-1,2-Dichloroethene	5	1	5
Chloroform	5	1	5
Bromochloromethane	5	1	5
1,1,1-Trichloroethane	5	1	5
Carbon tetrachloride	5	1	5
1,1-Dichloropropene	5	1	5
Benzene	5	1	5
1,2-Dichloroethane	5	1	5
Trichloroethene	5	1	5
1,2-Dichloropropane	5	1	5
Bromodichloromethane	5	1	5
Dibromomethane	5	1	5
cis-1,3-Dichloropropene	5	1	5
Toluene	5	1	5
Trans-1,3-Dichloropropene	5	1	5
1,1,2-Trichloroethane	5	1	5
Tetrachloroethene	5	1	5
1,3-Dichloropropane	5	1	5
Dibromochloromethane	5	1	5
1,2-Dibromoethane	5	1	5
1-Chlorohexane	5	1	5
Chlorobenzene	5	1	5
1,1,1,2-Tetrachloroethane	5	1	5
Ethyl benzene	5	1	5
p-Xylene	5	1	5
m-Xylene	5	1	5
o-Xylene	5	1	5
Styrene	5	1	5
Bromoform	5	1	5
Isopropylbenzene	5	1	5
1,1,2,2-Tetrachloroethane	5	1	5
Bromobenzene	5	1	5
1,2,3-Trichloropropane	5	1	5

Analyte Volatile Organic Compounds SW-8260B	Aqueous Samples		Soil Samples
	Estimated Reporting Limit[(b)] (µg/L) 5 ml purge	Estimated Reporting Limit[(b)] (µg/L) 25 ml purge	Estimated Reporting Limit[(b)] (µg/kg) Low level Soil/sediment
n-Propylbenzene	5	1	5
2-Chlorotoluene	5	1	5
1,3,5-Trimethylbenzene	5	1	5
4-Chlorotoluene	5	1	5
tert-Butylbenzene	5	1	5
1,2,4-Trimethylbenzene	5	1	5
sec-Butylbenzene	5	1	5
p-Isopropyltoluene	5	1	5
1,3-Dichlorobenzene	5	1	5
1,4-Dichlorobenzene	5	1	5
n-Butylbenzene	5	1	5
1,2-Dichlorobenzene	5	1	5
1,2-Dibromo-3-chloropropane	5	1	5
1,2,4-Trichlorobenzene	5	1	5
Hexachlorobutadiene	5	1	5
Naphthalene	5	1	5
1,2,3-Trichlorobenzene	5	1	5

QC Acceptance Criteria for Method 8260B

Analyte Volatile Organic Compounds SW-8260B	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
Dichlorodifluoromethane	75-125	≤ 20	65-140	≤ 30
Chloromethane	75-125	≤ 20	65-140	≤ 30
Vinyl chloride	40-125	≤ 20	30-145	≤ 30
Bromomethane	75-125	≤ 20	65-140	≤ 30
Chloroethane	60-125	≤ 20	50-140	≤ 30
Trichlorofluoromethane	65-125	≤ 20	55-140	≤ 30
1,1-Dichloroethene	75-125	≤ 20	65-140	≤ 30
Methylene chloride	75-125	≤ 20	65-140	≤ 30
trans-1,2-Dichloroethene	75-125	≤ 20	65-140	≤ 30
1,1-Dichloroethane	75-125	≤ 20	65-140	≤ 30
2,2-Dichloropropane	75-125	≤ 20	65-140	≤ 30
cis-1,2-Dichloroethene	75-125	≤ 20	65-140	≤ 30
Chloroform	75-125	≤ 20	65-140	≤ 30
Bromochloromethane	75-125	≤ 20	65-140	≤ 30
1,1,1-Trichloroethane	75-125	≤ 20	65-140	≤ 30
Carbon tetrachloride	60-125	≤ 20	50-140	≤ 30
1,1-Dichloropropene	75-125	≤ 20	65-140	≤ 30
Benzene	75-125	≤ 20	65-140	≤ 30
1,2-Dichloroethane	65-125	≤ 20	65-140	≤ 30
Trichloroethene	75-125	≤ 20	65-140	≤ 30
1,2-Dichloropropane	75-125	≤ 20	65-140	≤ 30
Bromodichloromethane	75-125	≤ 20	65-140	≤ 30
Dibromomethane	65-125	≤ 20	55-140	≤ 30
cis-1,3-Dichloropropene	75-125	≤ 20	65-140	≤ 30
Toluene	75-125	≤ 20	65-140	≤ 30
Trans-1,3-Dichloropropene	65-125	≤ 20	55-140	≤ 30
1,1,2-Trichloroethane	75-125	≤ 20	65-140	≤ 30
Tetrachloroethene	75-125	≤ 20	65-140	≤ 30
1,3-Dichloropropane	75-125	≤ 20	65-140	≤ 30
Dibromochloromethane	70-125	≤ 20	60-140	≤ 30
1,2-Dibromoethane	75-125	≤ 20	65-140	≤ 30
1-Chlorohexane	75-125	≤ 20	65-140	≤ 30
Chlorobenzene	75-125	≤ 20	65-140	≤ 30
1,1,1,2-Tetrachloroethane	75-125	≤ 20	65-140	≤ 30
Ethyl benzene	75-125	≤ 20	65-140	≤ 30
p-Xylene	75-125	≤ 20	65-140	≤ 30
m-Xylene	75-125	≤ 20	65-140	≤ 30
o-Xylene	75-125	≤ 20	65-140	≤ 30
Styrene	75-125	≤ 20	65-140	≤ 30
Bromoform	75-125	≤ 20	65-140	≤ 30
Isopropylbenzene	75-125	≤ 20	65-140	≤ 30
1,1,2,2-Tetrachloroethane	75-125	≤ 20	65-140	≤ 30
Bromobenzene	75-125	≤ 20	65-140	≤ 30
1,2,3-Trichloropropane	75-125	≤ 20	65-140	≤ 30
n-Propylbenzene	75-125	≤ 20	65-140	≤ 30

Analyte Volatile Organic Compounds SW-8260B	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
2-Chlorotoluene	75-125	≤ 20	65-140	≤ 30
1,3,5-Trimethylbenzene	70-125	≤ 20	60-140	≤ 30
4-Chlorotoluene	75-125	≤ 20	65-140	≤ 30
tert-Butylbenzene	75-125	≤ 20	65-140	≤ 30
1,2,4-Trimethylbenzene	75-125	≤ 20	65-140	≤ 30
sec-Butylbenzene	75-125	≤ 20	65-140	≤ 30
p-Isopropyltoluene	75-125	≤ 20	65-140	≤ 30
1,3-Dichlorobenzene	75-125	≤ 20	65-140	≤ 30
1,4-Dichlorobenzene	75-125	≤ 20	65-140	≤ 30
n-Butylbenzene	75-125	≤ 20	65-140	≤ 30
1,2-Dichlorobenzene	75-125	≤ 20	65-140	≤ 30
1,2-Dibromo-3-chloropropane	55-125	≤ 20	40-140	≤ 30
1,2,4-Trichlorobenzene	75-125	≤ 20	65-140	≤ 30
Hexachlorobutadiene	75-125	≤ 20	65-140	≤ 30
Naphthalene	75-125	≤ 20	65-140	≤ 30
1,2,3-Trichlorobenzene	75-125	≤ 20	65-140	≤ 30
Surrogates				
Dibromofluoromethane	75-125		65-140	
Toluene-d8	75-125		65-140	
4-Bromofluorobenzene	75-125		65-140	
1,2-Dichloroethane-d4	60-140		50-150	

Estimated Reporting Limits for Method 8270C

Analyte Semi-volatile Organic Compounds SW-8270C	Aqueous Samples	Soil Samples
	Estimated Reporting Limit (µg/l)	Estimated Reporting Limit (µg/kg) Low level Soil/sediment
Acenapthene	10	660
Acenaphthylene	10	660
Anthracene	10	660
Benzo(a)anthracene	10	660
Benzo(b)fluoranthene	10	660
Benzo(k)fluoranthene	10	660
Benzoic acid	50	3300
Benzo(g,h,i)perylene	10	660
Benzo(a)pyrene	10	660
Benzyl alcohol	20	1300
Bis(2-Chloroethoxy) methane	10	660
Bis(2-Chloroethyl) ether	10	660
Bis(2-Chloroisopropyl) ether	10	660
4-Bromophenyl phenyl ether	10	660
Butyl benzyl phthalate	10	660
4-Chloroaniline	20	1300
4-Chloro-3-methylphenol	20	1300
2-Chloronaphthalene	10	660
2-Chlorophenol	10	660
4-Chlorophenyl phenyl ether	10	660
Chrysene	10	660
Dibenz(a,h)anthracene	10	660
Dibenzofuran	10	660
Di-n-butylphthalate	10	660
1,2-Dichlorobenzene	10	660
1,3-Dichlorobenzene	10	660
1,4-Dichlorobenzene	10	660
3,3 ‘-Dichlorobenzidine	20	1300
2,4-Dichlorophenol	10	660
Diethylphthalate	10	660
2,4-Dimethylphenol	10	660
Dimethyl phthalate	10	660
4,6-Dinitro-2-methylphenol	50	3300
2,4-Dinitrophenol	50	3300
2,4-Dinitrotoluene	10	660
2,6-Dinitrotoluene	10	660
Di-n-octyl phthalate	10	660
bis(2-Ethylhexyl)phthalate	10	660
Ethyl methanesulfonate	20	ND
Fluoranthene	10	660
Fluorene	10	660
Hexachlorobenzene	10	660
Hexachlorobutadiene	10	660

Analyte Semi-volatile Organic Compounds SW-8270C	Aqueous Samples	Soil Samples
	Estimated Reporting Limit (µg/l)	Estimated Reporting Limit (µg/kg) Low level Soil/sediment
Hexachlorocyclopentadiene	10	660
Hexachloroethane	10	660
Indeno(1,2,3-cd)pyrene	10	660
Isophorone	10	660
2-Methylnaphthalene	10	660
2-Methylphenol	10	660
4-Methylphenol	10	660
Naphthalene	10	660
2-Nitroaniline	50	3300
3-Nitroaniline	50	3300
4-Nitroaniline	20	3300
Nitrobenzene	10	660
2-Nitrophenol	10	660
4-Nitrophenol	50	3300
N-Nitrosodiphenylamine	10	660
N-Nitroso-di-n-propylamine	10	660
Pentachlorophenol	50	3300
Phenanthrene	10	660
Phenol	10	660
Pyrene	10	660
1,2,4-Trichlorobenzene	10	660
2,4,5-Trichlorophenol	10	660
2,4,6-Trichlorophenol	10	660

QC Acceptance Criteria for Method 8270C

Analyte Semi-volatile Organic Compounds SW-8270C	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
Acenapthene	45-125	≤ 20	35-135	≤30
Acenaphthylene	45-125	≤ 20	35-135	≤30
Anthracene	45-165	≤ 20	35-175	≤30
Benzo(a)anthracene	50-135	≤ 20	40-145	≤30
Benzo(b)fluoranthene	35-125	≤ 20	25-135	≤30
Benzo(k)fluoranthene	35-125	≤ 20	25-135	≤30
Benzoic acid	25-160	≤ 20	20-170	≤30
Benzo(g,h,i)perylene	35-150	≤ 20	25-160	≤30
Benzo(a)pyrene	40-125	≤ 20	30-135	≤30
Benzyl alcohol	35-125	≤ 20	25-135	≤30
bis(2-Chloroethoxy) methane	45-125	≤ 20	35-135	≤30
bis(2-Chloroethyl) ether	45-125	≤ 20	30-135	≤30
bis(2-Chloroisopropyl) ether	35-170	≤ 20	25-175	≤30
4-Bromophenyl phenyl ether	50-130	≤ 20	40-140	≤30
Butyl benzyl phthalate	25-125	≤ 20	25-135	≤30
4-Chloroaniline	45-140	≤ 20	35-150	≤30
4-Chloro-3-methylphenol	40-125	≤ 20	40-145	≤30
2-Chloronaphthalene	60-125	≤ 20	50-135	≤30
2-Chlorophenol	40-125	≤ 20	30-135	≤30
4-Chlorophenyl phenyl ether	50-130	≤ 20	30-135	≤30
Chrysene	55-135	≤ 20	45-145	≤30
Dibenz(a,h)anthracene	50-125	≤ 20	40-135	≤30
Dibenzofuran	50-125	≤ 20	40-135	≤30
Di-n-butylphthalate	30-130	≤ 20	25-140	≤30
1,2-Dichlorobenzene	40-160	≤ 20	30-135	≤30
1,3-Dichlorobenzene	30-125	≤ 20	25-135	≤30
1,4-Dichlorobenzene	30-125	≤ 20	25-135	≤30
3,3 '-Dichlorobenzidine	25-175	≤ 20	25-175	≤30
2,4-Dichlorophenol	45-125	≤ 20	35-135	≤30
Diethylphthalate	35-125	≤ 20	25-135	≤30
2,4-Dimethylphenol	45-140	≤ 20	35-150	≤30
Dimethyl phthalate	25-175	≤ 20	25-175	≤30
4,6-Dinitro-2-methylphenol	25-135	≤ 20	25-145	≤30
2,4-Dinitrophenol	30-150	≤ 20	25-160	≤30
2,4-Dinitrotoluene	35-140	≤ 20	25-150	≤30
2,6-Dinitrotoluene	50-125	≤ 20	40-135	≤30
Di-n-octyl phthalate	35-130	≤ 20	25-140	≤30
bis(2-Ethylhexyl)phthalate	30-140	≤ 20	25-140	≤30
Fluoranthene	45-125	≤ 20	35-135	≤30
Fluorene	45-140	≤ 20	35-150	≤30
Hexachlorobenzene	45-135	≤ 20	35-145	≤30
Hexachlorobutadiene	25-125	≤ 20	25-135	≤30
Hexachlorocyclopentadiene	40-125	≤ 20	30-135	≤30
Hexachloroethane	25-135	≤ 20	25-160	≤30
Indeno(1,2,3-cd)pyrene	25-160	≤ 20	25-170	≤30

Analyte Semi-volatile Organic Compounds SW-8270C	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
Isophorone	25-175	≤ 20	25-175	≤30
2-Methylnaphthalene	40-125	≤ 20	30-135	≤30
2-Methylphenol	25-125	≤ 20	25-135	≤30
4-Methylphenol	30-125	≤ 20	25-135	≤30
Naphthalene	50-125	≤ 20	40-135	≤30
2-Nitroaniline	50-125	≤ 20	40-135	≤30
3-Nitroaniline	50-125	≤ 20	40-135	≤30
4-Nitroaniline	40-145	≤ 20	30-155	≤30
Nitrobenzene	45-135	≤ 20	35-145	≤30
2-Nitrophenol	40-125	≤ 20	35-135	≤30
4-Nitrophenol	25-135	≤ 20	25-140	≤30
N-Nitrosodiphenylamine	25-125	≤ 20	25-135	≤30
N-Nitroso-di-n-propylamine	35-125	≤ 20	25-135	≤30
Pentachlorophenol	25-140	≤ 20	35-150	≤30
Phenanthrene	50-125	≤ 20	40-135	≤30
Phenol	25-125	≤ 20	25-135	≤30
Pyrene	45-140	≤ 20	35-150	≤30
1,2,4-Trichlorobenzene	40-140	≤ 20	30-150	≤30
2,4,5-Trichlorophenol	25-175	≤ 20	25-175	≤30
2,4,6-Trichlorophenol	35-130	≤ 20	25-140	≤30
Surrogates:				
2,4,6-Tirbromophenol	25-135		25-145	
2-Fluorobiphenyl	40-125		30-135	
2-Fluorophenol	25-125		25-135	
Nitrobenzene-d5	30-125		25-135	
Phenol-d5	25-125		25-135	
Terphenyl-d14	40-130		30-140	

Estimated Reporting Limits for Method 8081A

Analyte Organochlorine Pesticides SW-8081A	GC/ECD Estimated Reporting Limit[(a)] (µg/L)	GC/ECD Estimated Reporting Limit[(b)] (µg/kg)
Aldrin	0.05	1.75
a-BHC	0.05	1.75
b-BHC	0.05	1.75
d-BHC	0.05	1.75
g-BHC	0.05	1.75
a-Chlordane	0.05	1.75
g-Chlordane	0.05	1.75
4,4 ¢-DDD	0.10	3.3
4,4 ¢-DDE	0.10	3.3
4,4 ¢-DDT	0.10	3.3
Dieldrin	0.10	3.3
Endosulfan I	0.05	1.75
Endosulfan II	0.10	3.3
Endosulfan sulfate	0.10	3.3
Endrin	0.10	3.3
Endrin aldehyde	0.10	3.3
Endrin ketone	0.10	3.3
Heptachlor	0.05	1.75
Heptachlor epoxide	0.05	1.75
Methoxychlor	0.50	17
Toxaphene	5.0	170

Notes:

(a) Estimated reporting limits are calculated by multiplying the estimated detection limit times a factor of 10; estimated detection limit defined as either the MDL (40 CFR Part 136, Appendix B, Revision1.11), or a concentration of analyte in a sample yielding a peak in the final extract with signal-to-noiseratio of approximately 5, whichever value is higher.

(b) Estimated reporting limits are calculated by multiplying the estimated detection limit times a factor of 10. Detection limits determined from standard solutions corrected back to 50 g samples, extracted and concentrated to 10 mL, with 5 µL injected. Chromatography using narrow bore capillary column.

QC Acceptance Criteria for Method 8081A

Analyte Method 8081A	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
Aldrin	45-125	≤ 30	25-135	≤ 50
a-BHC	75-125	≤ 30	55-135	≤ 50
b-BHC	50-125	≤ 30	35-135	≤ 50
d-BHC	75-125	≤ 30	55-140	≤ 50
g-BHC	70-125	≤ 30	55-135	≤ 50
a-Chlordane	45-125	≤ 30	30-140	≤ 50
g-Chlordane	45-125	≤ 30	30-140	≤ 50
4,4 ¢-DDD	45-140	≤ 30	35-150	≤ 50
4,4 ¢-DDE	45-140	≤ 30	30-150	≤ 50
4,4 ¢-DDT	30-145	≤ 30	20-160	≤ 50
Dieldrin	40-130	≤ 30	30-145	≤ 50
Endosulfan I	50-140	≤ 30	35-155	≤ 50
Endosulfan II	75-160	≤ 30	60-170	≤ 50
Endosulfan sulfate	45-140	≤ 30	30-155	≤ 50
Endrin	45-135	≤ 30	30-145	≤ 50
Endrin aldehyde	75-150	≤ 30	60-160	≤ 50
Endrin ketone	65-135	≤ 30	60-160	≤ 50
Heptachlor	45-130	≤ 30	30-140	≤ 50
Heptachlor epoxide	50-135	≤ 30	40-145	≤ 50
Methoxychlor	70-140	≤ 30	60-155	≤ 50
Toxaphene	40-130	≤ 30	30-140	≤ 50
Surrogates				
DCBP	30-135		30-135	
TMX	40-125		40-125	

Estimated Reporting Limits for Method 8151A

Analyte Chlorinated Phenoxy Acid Herbicides SW-8151A	Aqueous Samples	Soil Samples
	GC/ECD Estimated Reporting Limit (µg/l)	Estimated Reporting Limit (µg/kg) Low level Soil/sediment
Acifluorfen	0.96	NA
Bentazon	2.0	NA
Chloramben	0.93	40
2,4-D	2.0	1.1
Dalapon	13	1.2
2,4-DB	8.0	NA
DCPA diacid(d)	0.2	NA
Dicamba	0.81	NA
3,5-Dichlorobenzoic acid	0.61	3.8
Dichloroprop	2.6	NA
Dinoseb	1.9	NA
5-Hydroxydicamba	4.0	NA
MCPP	0.9(c)	660
MCPA	0.56(c)	430
4-Nitrophenol	1.3	3.4
Pentachlorophenol	0.76	1.6
Picloram	1.4	NA
2,4,5-T	0.8	NA
2,4,5-TP (Silvex)	0.75	2.8

Notes:

(a) Estimated reporting limits are calculated by multiplying the estimated detection limit times a factor of 10; estimated detection limit defined as either the MDL (40 CFR Part 136, Appendix B, Revision 1.11), or a concentration of analyte in a sample yielding a peak in the final extract with signal-to-noise ratio of approximately 5, whichever value is higher.

(b) Estimated reporting limits are calculated by multiplying the estimated detection limit times a factor of 10. Detection limits determined from standard solutions corrected back to 50 g samples, extracted and concentrated to 10 mL, with 5 µL injected. Chromatography using narrow bore capillary column, 0.25 □m film, 5% phenyl/95% methyl silicone.

(c) 40 CFR Part 136, Appendix B (49 FR 43234). Chromatography using wide-bore capillary column.

(d) DCPA monoacid and diacid metabolites included in method scope; DCPA diacid metabolite used for validation studies. DCPA is a dimethyl ester.

QC Acceptance Criteria for Method 8151A

Analyte Chlorinated Phenoxy Acid Herbicide SW-8151A	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
Acifluorfen	60-125	≤ 30	50-135	≤ 50
Bentazon	60-125	≤ 30	50-135	≤ 50
Chloramben	60-125	≤ 30	50-135	≤ 50
2,4-D	60-125	≤ 30	50-135	≤ 50
Dalapon	60-125	≤ 30	50-135	≤ 50
2,4-DB	60-125	≤ 30	50-135	≤ 50
DCPA diacid[(d)]	60-125	≤ 30	50-135	≤ 50
Dicamba	60-125	≤ 30	50-135	≤ 50
3,5-Dichlorobenzoic acid	60-125	≤ 30	50-135	≤ 50
Dichloroprop	60-125	≤ 30	50-135	≤ 50
Dinoseb	60-125	≤ 30	50-135	≤ 50
5-Hydroxydicamba	60-125	≤ 30	50-135	≤ 50
MCPP	60-125	≤ 30	50-135	≤ 50
MCPA	60-125	≤ 30	50-135	≤ 50
4-Nitrophenol	60-125	≤ 30	50-135	≤ 50
Pentachlorophenol	60-125	≤ 30	50-135	≤ 50
Picloram	60-125	≤ 30	50-135	≤ 50
2,4,5-T	60-125	≤ 30	50-135	≤ 50
2,4,5-TP (Silvex)	60-125	≤ 30	50-135	≤ 50
Surrogates				
2,4-Dichlorophenylacetic acid	60-135	≤ 30	50-150	≤ 50
2,3,5,6-Tetraflourobenzoic acid	70-130	≤ 30	60-140	≤ 50

Estimated Reporting Limits for Method 6010B

Analyte Inorganic Metals SW-6010B	Aqueous Samples	Soil/Sediment Samples
	Estimated Reporting Limit (µg/l)	Estimated Reporting Limit (mg/kg)
Aluminum	200	10
Antimony	60	3
Arsenic	10	0.5
Barium	200	10
Beryllium	5	0.25
Cadmium	5	0.25
Calcium	5000	250
Chromium	10	0.5
Cobalt	50	2.5
Copper	10	0.5
Iron	100	5
Lead	3	0.15
Magnesium	5000	250
Manganese	15	0.75
Nickel	40	2
Potassium	5000	250
Selenium	5	0.25
Silver	10	0.5
Sodium	5000	250
Thallium	10	0.5
Vanadium	50	2.5
Zinc	20	1.0

QC Acceptance Criteria for Method 6010B

Analyte Inorganic Metals SW-6010B	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
Aluminum	75-125	≤ 20	60-140	≤ 35
Antimony	75-125	≤ 20	60-140	≤ 35
Arsenic	75-125	≤ 20	60-140	≤ 35
Barium	75-125	≤ 20	60-140	≤ 35
Beryllium	75-125	≤ 20	60-140	≤ 35
Cadmium	75-125	≤ 20	60-140	≤ 35
Calcium	75-125	≤ 20	60-140	≤ 35
Chromium	75-125	≤ 20	60-140	≤ 35
Cobalt	75-125	≤ 20	60-140	≤ 35
Copper	75-125	≤ 20	60-140	≤ 35
Iron	75-125	≤ 20	60-140	≤ 35
Lead	75-125	≤ 20	60-140	≤ 35
Magnesium	75-125	≤ 20	60-140	≤ 35
Manganese	75-125	≤ 20	60-140	≤ 35
Nickel	75-125	≤ 20	60-140	≤ 35
Potassium	75-125	≤ 20	60-140	≤ 35
Selenium	75-125	≤ 20	60-140	≤ 35
Silver	75-125	≤ 20	60-140	≤ 35
Sodium	75-125	≤ 20	60-140	≤ 35
Thallium	75-125	≤ 20	60-140	≤ 35
Vanadium	75-125	≤ 20	60-140	≤ 35
Zinc	75-125	≤ 20	60-140	≤ 35

Estimated Reporting Limits for Method SW7470A/SW7471A

Analyte SW-7470A/7471A	Aqueous Samples	Soil Samples
	Estimated Reporting Limit (mg/L)	Estimated Reporting Limit (mg/Kg)
Mercury	0.001	0.1

QA Acceptance Criteria for Method SW7470A/SW7471A

Analyte SW-7470A/7471A	Accuracy Water (%R)	Precision Water (% RPD)	Accuracy Soil (%R)	Precision Soil (% RPD)
Mercury	75-125	≤ 25	70-130	≤ 30

Estimated Reporting Limits for Method SW9010A/SW9012

Analyte SW-9010A/9012	Aqueous Samples
	Estimated Reporting Limit (mg/L)
Total cyanide	0.02

QA Acceptance Criteria for Method SW9010A/SW9012

Analyte SW-9010A/9012	Accuracy Water (% R)	Precision Water (% RPD)
Total cyanide	75-125	$\leq$ 20

Appendix B

Various Sampling Approaches

SAMPLING APPROACHES

Introduction

Development of a sampling design may follow the seven steps outlined in the USEPA publication, "Guidance for the Data Quality Objectives Process." The Data Quality Objectives (DQOs) process is a logical step-by-step method of identifying the study objective, defining the appropriate type of data to collect, clarifying the decisions that will be based on the data collected, and considering the potential limitations with alternate sampling designs. Investigations may be executed without completing the DQO process step-by-step; however, the basic elements of the DQO process should be considered by the project leader for each investigation.

Sampling designs are typically either non-probabilistic (directed sampling designs) or probabilistic (random sampling designs) in nature. The sampling design ultimately must meet specific study objectives. The location and frequency of sampling (number of samples) should be clearly outlined in the sampling design, as well as provisions for access to all areas of the site, the use of special sampling equipment, etc.

Representative Sampling

A "representative sample" is often defined as a sample that reflects one or more characteristics of the population being sampled. For example, the characteristic, which is desired to be reflected by the sample, may be the average, minimum, or maximum concentration of a constituent of concern. Ultimately a representative sample is defined by the study objectives. For instance, the objective of the study may be to determine the maximum concentration of lead in the sludge from a surface impoundment. One sample collected near the inlet to the impoundment may provide that information. The collection of a representative sample may be influenced by factors such as equipment design, sampling techniques, and sample handling.

Stratification and Heterogeneous Wastes

Environmental media, as well as waste matrices, may be stratified, i.e., different portions of the population, which may be separated temporally or spatially, may have similar characteristics or properties which are different from adjacent portions of the population. An example would be a landfill that contains a trench, which received an industrial waste contaminated with chromium. The trench would be considered a strata within the landfill if chromium was the contaminant of concern. A special case, "stratification by component", is often observed with waste matrices when the constituent of interest is associated with one component of the matrix. An example would be slag contaminated with lead that is mixed with otherwise uncontaminated firebrick. Thus the lead is stratified by component, that being the slag. Stratified sampling designs are discussed later which incorporate independent sampling of each strata, thereby reducing the number of samples required.

Some environmental and waste matrices may be, for purposes of the field investigation, homogeneous (for instance the surface water in a limited segment of a small stream). If the composition of the matrix and the distribution of contaminants are known, or can be estimated, less sampling may be necessary to define the properties of interest. An estimate of the variability in contaminant distribution may be based on knowledge, or determined by preliminary sampling. The more heterogeneous the matrix, the greater the planning and sampling requirements.

Specific Sampling Designs

Sampling strategies used by the Branch typically fall into two general groups: directed or probabilistic. Directed or "authoritative" approaches typically rely on the judgement and experience of the investigators, as well as available information on the matrix of concern. Probabilistic, or "statistical" approaches may be appropriate when estimates on uncertainty and specific confidence levels in the results are required. The probabilistic approaches include: simple random sampling, stratified random sampling, and systematic grid sampling. The main feature of a probabilistic approach is that each location at the site has an equal probability of being sampled, therefore statistical bias is minimized.

Authoritative or Directed Sampling

Directed sampling is based on the judgement of the investigator, and does not necessarily result in a sample that reflects the average characteristics of the entire matrix. Directed sampling is also called authoritative or judgmental sampling, and is considered non-probabilistic. The experience of the investigator is often the basis for sample collection, and bias (depending on the study objectives) should be recognized as a potential problem. However, preliminary or screening investigations, and certain regulatory investigations, may correctly employ directed sampling. Directed sampling may focus on "worst case" conditions in a matrix, for example, the most visually contaminated area or the most recently generated waste. In the presence of high temporal or spacial variability, directed samples have a very limited degree of representativeness.

Simple Random Sampling

Simple random sampling insures that each element in the population has an equal chance of being included in the sample. This is often be the method of choice when, for purposes of the investigation, the matrix is considered homogeneous or when the population is randomly heterogeneous. If the population contains trends or patterns of contamination, a stratified random sampling or systematic grid sampling strategy would be more appropriate.

Systematic Sampling Over Time or Space

Systematic sampling over time at the point of generation is useful if the material was sampled from a wastewater sewer, a materials conveyor belt, or being delivered via truck or pipeline. The sampling interval would be determined on a time basis, for example every hour from a conveyor belt or pipeline discharge, or from every third truck load. Systematic sampling over space might involve the collection of samples at defined intervals from a ditch, stream, or other matrix that is spatially unique.

Stratified Random Sampling

Stratified random sampling may be useful when distinct strata or "homogeneous sub-groups" are identified within the population. The strata could be located in different areas of the population, or the strata may be comprised of different layers. This approach is useful when the individual strata may be considered internally homogeneous, or at least have less internal variation, in what would otherwise be considered a heterogeneous population. Information on the site is usually required to establish the location of individual strata. A grid may be utilized for sampling several horizontal layers if the strata are horizontally oriented. A simple random sampling approach is typically utilized for sample collection

within each strata. The use of a stratified random sampling strategy may result in the collection of fewer samples.

Systematic Grid Sampling

Systematic grid sampling involves the collection of samples at fixed intervals when the contamination is assumed to be randomly distributed. This method is commonly used with populations when estimating trends or patterns of contamination. This approach may not be acceptable if the entire population is not accessible, or if the systematic plan becomes "phased" with variations in the distribution of contaminants within the matrix. This approach may also be useful for identifying the presence of strata within the population. The grid and starting points should be randomly laid out over the site, yet the method allows for rather easy location of exact sample locations within each grid. Also, the grid size would typically be adjusted according to the number of samples that are required.

Appendix C

Standard Operating Procedures

Appendix D

Field Decontamination Procedures

STANDARD FIELD DECONTAMINATION PROCEDURES

D.1.0 Introduction

These procedures are intended for use by field personnel for cleaning sampling and other equipment in the field. Emergency field sample container cleaning procedures are also included; however, they should not be used unless absolutely necessary.

Sampling and field equipment cleaned in accordance with these procedures must meet the minimum requirements for Data Quality Objectives (DQO) definitive data collection. Deviations from these procedures should be documented in the approved study plan, field records, and investigative reports.

These are the materials, methods, and procedures to be used when cleaning sampling and other equipment in the field.

D.1.1 Specifications for Cleaning Materials

Specifications for standard cleaning materials referred to in this appendix are as follows:

- Soap shall be a standard brand of phosphate-free laboratory detergent such as Liquinox®. Use of other detergent must be justified and documented in the field logbooks and inspection or investigative reports.

- Solvent shall be pesticide-grade isopropanol. Use of a solvent other than pesticide-grade isopropanol for equipment cleaning purposes must be justified in the study plan. Otherwise its use must be documented in field logbooks and inspection or investigation reports.

- Tap water may be used from any municipal water treatment system. Use of an untreated potable water supply is not an acceptable substitute for tap water.

- Analyte free water (deionized water) is tap water that has been treated by passing through a standard deionizing resin column. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds (i.e., at or above analytical detection limits) as defined by a standard inductively coupled Argon Plasma Spectrophotometer (ICP) (or equivalent) scan. Analyte free water obtained by other methods is acceptable, as long as it meets the above analytical criteria.

- Organic/analyte free water is defined as tap water that has been treated with activated carbon and deionizing units. A portable system to produce organic/analyte free water under field conditions is available. At a minimum, the finished water must meet the analytical criteria of analyte free water and should contain no detectable pesticides, herbicides, or extractable organic compounds, and no volatile organic compounds above minimum detectable levels. Organic/analyte free water obtained by other methods is acceptable, as long as it meets the above analytical criteria.

- Other solvents may be substituted for a particular purpose if required. For example, removal of concentrated waste materials may require the use of either pesticide-grade hexane or petroleum ether. After the waste material is removed, the equipment must be subjected to the standard

cleaning procedure. Because these solvents are not miscible with water, the equipment must be completely dry prior to use.

Solvents, laboratory detergent, and rinse waters used to clean equipment shall not be reused during field decontamination.

D.1.2 Handling and Containers for Cleaning Solutions

Improperly handled cleaning solutions may easily become contaminated. Storage and application containers must be constructed of the proper materials to ensure their integrity. Following are acceptable materials used for containing the specified cleaning solutions:

- Soap must be kept in clean plastic, metal, or glass containers until used. It should be poured directly from the container during use.

- Solvent must be stored in the unopened original containers until used. They may be applied using the low-pressure nitrogen system fitted with a Teflon® nozzle, or using Teflon® squeeze bottles.

- Tap water may be kept in clean tanks, hand pressure sprayers, squeeze bottles, or applied directly from a hose.

- Analyte free water must be stored in clean glass, stainless steel, or plastic containers that can be closed prior to use. It can be applied from plastic squeeze bottles.

- Organic/analyte free water must be stored in clean glass, Teflon®, or stainless steel containers prior to use. It may be applied using Teflon® squeeze bottles, or with the portable system.

Note: Hand pump sprayers generally are not acceptable storage or application containers for the above materials (with the exception of tap water). This also applies to stainless steel sprayers. All hand sprayers have internal oil coated gaskets and black rubber seals that may contaminate the solutions.

D.1.3 Disposal of Solvent Cleaning Solutions

Procedures for the safe handling and disposition of investigation derived waste (IDW), including used wash water, rinse water, and spent solvents will be developed as required.

D.1.4 Equipment Contaminated with Concentrated Wastes

Equipment used to collect samples of hazardous materials or toxic wastes or materials from hazardous waste sites, RCRA facilities, or in-process waste streams should be field cleaned before returning from the study. At a minimum, this should consist of washing with soap and rinsing with tap water. More stringent procedures may be required at the discretion of the field investigators.

D.1.5 Safety Procedures for Field Cleaning Operations

Some of the materials used to implement the cleaning procedures outlined in this appendix can be harmful if used improperly. Caution should be exercised by all field investigators and all applicable safety

procedures should be followed. At a minimum, the following precautions should be taken in the field during these cleaning operations:

- Safety glasses with splash shields or goggles, and latex gloves will be worn during all cleaning operations.
- Solvent rinsing operations will be conducted in the open (never in a closed room).
- No eating, smoking, drinking, chewing, or any hand to mouth contact should be permitted during cleaning operations.

D.1.6 Handling of Cleaned Equipment

After field cleaning, equipment should be handled only by personnel wearing clean gloves to prevent re-contamination. In addition, the equipment should be moved away (preferably upwind) from the cleaning area to prevent recontamination. If the equipment is not to be immediately re-used it should be covered with plastic sheeting or wrapped in aluminum foil to prevent re-contamination. The area where the equipment is kept prior to re-use must be free of contaminants.

D.2.0 Field Equipment Cleaning Procedures

Sufficient clean equipment should be transported to the field so that an entire study can be conducted without the need for field cleaning.

However, this is not possible for some specialized items such as portable power augers (Little Beaver®), well drilling rigs, soil coring rigs, and other large pieces of field equipment. In addition, particularly during large-scale studies, it is not practical or possible to transport all of the pre-cleaned field equipment required into the field.

In these instances, sufficient pre-cleaned equipment should be transported to the field to perform at least one days work. The following procedures are to be utilized when equipment must be cleaned in the field.

D.2.1 Specifications for Decontamination Pads

Decontamination pads constructed for field cleaning of sampling and drilling equipment should meet the following minimum specifications:

- The pad should be constructed in an area known or believed to be free of surface contamination.
- The pad should not leak excessively.
- If possible, the pad should be constructed on a level, paved surface and should facilitate the removal of wastewater. This may be accomplished by either constructing the pad with one corner lower than the rest, or by creating a sump or pit in one corner or along one side. Any sump or pit should also be lined.

- Sawhorses or racks constructed to hold equipment while being cleaned should be high enough above ground to prevent equipment from being splashed.

- Water should be removed from the decontamination pad frequently.

- A temporary pad should be lined with a water impermeable material with no seams within the pad. This material should be either easily replaced (disposable) or repairable.

At the completion of site activities, the decontamination pad should be deactivated. The pit or sump should be backfilled with the appropriate material designated by the site project leader, but only after all waste/rinse water has been pumped into containers for disposal. No solvent rinsates will be placed in the pit. Solvent rinsates should be collected in separate containers for proper disposal. If the decontamination pad has leaked excessively, soil sampling may be required.

D.2.2 "Classic Parameter" Sampling Equipment

"Classic Parameters" are analyses such as oxygen demand, nutrients, certain inorganics, sulfide, flow measurements, etc.

For routine operations involving classic parameter analyses, water quality sampling equipment such as Kemmerers, buckets, dissolved oxygen dunkers, dredges, etc., may be cleaned with the sample or analyte-free water between sampling locations. A brush may be used to remove deposits of material or sediment, if necessary. If analyte-free water is samplers should be flushed at the next sampling location with the substance (water) to be sampled, but before the sample is collected.

Flow measuring equipment such as weirs, staff gages, velocity meters, and other stream gaging equipment may be cleaned with tap water between measuring locations, if necessary.

The previously described procedures are not to be used for cleaning field equipment to be used for the collection of samples undergoing trace organic or inorganic constituent analyses.

D.2.3 Sampling Equipment used for the Collection of Trace Organic and Inorganic Compounds

The following procedures are to be used for all sampling equipment used to collect routine samples undergoing trace organic or inorganic constituent analyses:

1. Clean with tap water and soap using a brush if necessary to remove particulate matter and surface films. Equipment may be steam cleaned (soap and high pressure hot water) as an alternative to brushing. Sampling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. PVC or plastic items should not be steam cleaned.

2. Rinse thoroughly with tap water.

3. Rinse thoroughly with analyte free water.

4. Rinse thoroughly with solvent. Do not solvent rinse PVC or plastic items.

5. Rinse thoroughly with organic/analyte free water. If organic/analyte free water is not available, equipment should be allowed to completely dry. Do not apply a final rinse with analyte water. Organic/analyte free water can be generated on-site utilizing the portable system.

6. Remove the equipment from the decontamination area and cover with plastic. Equipment stored overnight should be wrapped in aluminum foil and covered with clean, unused plastic.

D.2.4 Well Sounders or Tapes

1. Wash with soap and tap water.

2. Rinse with tap water.

3. Rinse with analyte free water.

D.2.5 Fultz® Pump Cleaning Procedure

CAUTION - To avoid damaging the Fultz® pump:

Never run pump when dry

Never switch directly from the forward to the reverse mode without pausing in the "OFF" position

The Fultz® pump should be cleaned prior to use and between each monitoring well. The following procedure is required:

1. Pump a sufficient amount of soapy water through the hose to flush out any residual purge water.

2. Using a brush, scrub the exterior of the contaminated hose and pump with soapy water. Rinse the soap from the outside of the hose with tap water. Rinse the hose with analyte-free water and recoil onto the spool.

3. Pump a sufficient amount of tap water through the hose to flush out all the soapy water (approximately one gallon).

4. Pump a sufficient amount of analyte-free water through the hose to flush out the tap water, then purge with the pump in the reverse mode.

5. Rinse the outside of the pump housing and hose with analyte-free water (approximately 1/4 gal.).

6. Place pump and reel in clean plastic bag.

D.2.6 Goulds® Pump Cleaning Procedure

CAUTION - During cleaning always disconnect the pump from the generator.

The Goulds© pump should be cleaned prior to use and between each monitoring well.

The following procedure is required:

1. Using a brush, scrub the exterior of the contaminated hose and pump with soap and tap water.
2. Rinse the soap from the outside of the pump and hose with tap water.
3. Rinse the tap water residue from the outside of pump and hose with analyte-free water.
4. Place the pump and hose in a clean plastic bag.

D.2.7 Redi-Flo2® Pump

The Redi-Flo2® pump should be cleaned prior to use and between each monitoring well. The following procedure is required:

CAUTION - Make sure the pump is not plugged in.

1. Using a brush, scrub the exterior of the pump, electrical cord and garden hose with soap and tap water. Do not wet the electrical plug.
2. Rinse with tap water.
3. Rinse with analyte free water.
4. Place the equipment in a clean plastic bag.

To clean the Redi-Flo2® ball check valve:

1. Completely dismantle ball check valve. Check for wear and/or corrosion, and replace as needed.
2. Using a brush, scrub all components with soap and tap water.
3. Rinse with analyte free water.
4. Reassemble and re-attach the ball check valve to the Redi-Flo2® pump head.

D.2.8 Automatic Sampler Tubing

The Silastic® and Tygon® tubing previously used in the automatic samplers may be field cleaned as follows:

1. Flush tubing with tap water and soap.
2. Rinse tubing thoroughly with tap water.
3. Rinse tubing with analyte free water.

D.3.0 Downhole Drilling Equipment

These procedures are to be used for drilling activities involving the collection of soil samples for trace organic and inorganic constituent analyses, and for the construction of monitoring wells to be used for the collection of groundwater samples for trace organic and inorganic constituent analyses.

D.3.1 Introduction

Cleaning and decontamination of all equipment should occur at a designated area (decontamination pad) on the site. The decontamination pad should meet the specifications of Section D.2.1.

Tap water (potable) brought on the site for drilling and cleaning purposes should be contained in a pre-cleaned tank of sufficient size so that drilling activities can proceed without having to stop and obtain additional water.

A steam cleaner and/or high pressure hot water washer capable of generating a pressure of at least 2500 PSI and producing hot water and/or steam (200° F plus), with a soap compartment, should be obtained.

D.3.2 Preliminary Cleaning and Inspection

The drill rig should be clean of any contaminants that may have been transported from another hazardous waste site, to minimize the potential for cross-contamination. Further, the drill rig itself should not serve as a source of contaminants. In addition, associated drilling and decontamination equipment, well construction materials, and equipment handling procedures should meet these minimum specified criteria:

- All downhole augering, drilling, and sampling equipment should be sandblasted before use if painted, and/or there is a buildup of rust, hard or caked matter, etc., that cannot be removed by steam cleaning (soap and high pressure hot water), or wire brushing. Sandblasting should be performed prior to arrival on site, or well away from the decontamination pad and areas to be sampled.

- Any portion of the drill rig, backhoe, etc., that is over the borehole (kelly bar or mast, backhoe buckets, drilling platform, hoist or chain pulldowns, spindles, cathead, etc.) should be steam cleaned (soap and high pressure hot water) and wire brushed (as needed) to remove all rust, soil, and other material which may have come from other hazardous waste sites before being brought on site.

- Printing and/or writing on well casing, tremie tubing, etc. should be removed before use. Emery cloth or sand paper can be used to remove the printing and/or writing. Most well material suppliers can supply materials without the printing and/or writing if specified when ordered.

- The drill rig and other equipment associated with the drilling and sampling activities should be inspected to insure that all oils, greases, hydraulic fluids, etc., have been removed, and all seals and gaskets are intact with no fluid leaks.

- PVC or plastic materials such as tremie tubes should be inspected. Items that cannot be cleaned are not acceptable and should be discarded.

D.3.3 Drill Rig Field Cleaning Procedure

Any portion of the drill rig, backhoe, etc., that is over the borehole (kelly bar or mast, backhoe buckets, drilling platform, hoist or chain pulldowns, spindles, cathead, etc.) should be steam cleaned (soap and high pressure hot water) between boreholes.

D.3.4 Field Cleaning Procedure for Drilling Equipment

The following is the standard procedure for field cleaning augers, drill stems, rods, tools, and associated equipment. This procedure does not apply to well casings, well screens, or split-spoon samplers used to obtain samples for chemical analyses, which should be cleaned as outlined in Section D.2.3.

1. Clean with tap water and soap, using a brush if necessary, to remove particulate matter and surface films. Steam cleaning (high-pressure hot water with soap) may be necessary to remove matter that is difficult to remove with the brush. Drilling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. Hollow-stem augers, drill rods, etc., that are hollow or have holes that transmit water or drilling fluids, should be cleaned on the inside with vigorous brushing.

2. Rinse thoroughly with tap water.

3. Remove from the decontamination pad and cover with clean, unused plastic. If stored overnight, the plastic should be secured to ensure that it stays in place.

When there is concern for low level contaminants it may be necessary to clean this equipment between borehole drilling and/or monitoring well installation using the procedure outlined in Section D.2.3.

D.4.0 Emergency Disposable Sample Container Cleaning

New one-pint or one-quart mason jars may be used to collect samples for analyses of organic compounds and metals in waste and soil samples during an emergency. These containers would also be acceptable on an emergency basis for the collection of water samples for extractable organic compounds, pesticides, and metals analyses. These jars cannot be used for the collection of water samples for volatile organic compound analyses.

The rubber sealing ring should not be in contact with the jar and aluminum foil should be used, if possible, between the jar and the sealing ring.

If possible, the jar and aluminum foil should be rinsed with pesticide-grade isopropanol and allowed to air dry before use. Several empty bottles and lids should be submitted to the laboratory as blanks for quality control purposes.